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SkillUp TVET LIMITED
Government Technical College,
Ikorodu City & Guilds Centre No 834027
28, Obafemi Awolowo Way
Oke Ota-Ona, Ikorodu

TABLE OF CONTENTS

MECHANICAL

BEARING MAINTENANCE & LUBRICATION	5
BASIC DIESEL ENGINE MAINTENANCE	6
MECHANICAL DRIVES MAINTENANCE	7
INDUSTRIAL PIPEFITTING	8
PUMPS & COMPRESSORS	9
REFRIGERATION & AIR-CONDITIONING	11
OXY-ACETYLENE WELDING	12
ELECTRIC ARC WELDING	14
METAL INERT GAS	16

ELECTRICAL

ELECTRICAL TROUBLESHOOTING USING BLUEPRINT	19
INDUSTRIAL MOTOR CONTROLS & MAINTENANCE	20

AUTOMATION

INDUSTRIAL HYDRAULICS	23
PNEUMATICS SYSTEMS & MAINTENANCE	25
ELECTRO-PNEUMATIC CONTROLS	27
PROGRAMMABLE LOGIC CONTROL (PLC)	28
ADVANCED PROGRAMMABLE LOGIC CONTROL (PLC)	30
PROCESS CONTROL & INSTRUMENTATION	31
PROCESS VISUALISATION & CONTROL	33
SENSOR TECHNOLOGY	34

CONSTRUCTION

HEALTH, SAFETY & ENVIRONMENT MANAGEMENT	36
BASIC BRICKLAYING/ BLOCKLAYING & CONCRETE	37
ELECTRICAL MAINTENANCE SKILLS (BUILDING SERVICES)	38
REFRIGERATION & AIR-CONDITIONING	40
PLUMBING	41
MAINTENANCE OF PLUMBING SYSTEMS	43
PAINTING & DECORATION	44



MECHANICAL COURSES

BEARING MAINTENANCE & LUBRICATION

COURSE DURATION: 3 days

COURSE DESCRIPTION

This course deals with the study of the nature, operations, maintenance and lubrication of bearings used in the Industry. Bearings are explained in terms of their design, construction, materials and their applications. It also includes discussion on bearing installation and maintenance procedures. Workshop practice consists mainly of testing, dismantling, assembly and installation.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Discuss the basic principles, design and maintenance of Bearings used in Industries
2. Explain the importance and functions of Bearings
3. Acquire practical skills and develop innovative techniques in installation, maintenance and lubrication of Bearings
4. Observe proper work habits and safety precautions in performing bearing related activities
5. Explain the role and benefits of lubrication system and lubricants in an industrial environment
6. Identify the types of lubricants and their applications
7. Follow strictly the lubrication system maintenance
8. Observe proper and effective lubrication practice

COURSE OUTLINE

1. **Plain Bearings:** Principles of operation, types and materials, application, maintenance practices and failure patterns
2. **Rolling Element Bearings (Ball and Roller):** Principles of operation, types of bearings, bearing assembly design, installation, maintenance practices, failure patterns, application and load supporting capacity and identification of bearing reference numbers
3. **Limits & Fits:** types of fit, allowance, accuracy & element of interchangeable systems and tolerances
4. **Friction:** nature and types of friction
5. **Lubrication:** Types of lubricants and their characteristics, applications, additives, bearing lubrication, lubricants storage and handling, safety regulations and servicing of lubricant devices

For Whom:

Non-mechanical Technicians, Maintenance Technicians/
Engineers and Electromechanical Technicians

For enquiries and Nomination contact:

Training Coordinator
training@skillupng.com
+234.809.999-2508, +234.813.406-7311



BASIC DIESEL ENGINE MAINTENANCE

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to develop basic knowledge and skills of the participants on servicing, troubleshooting and maintenance with the manufacturer's specification.



COURSE OBJECTIVES

At the end of the course the participants will be able to:

1. Understand engine theory and its principle of operation
2. Apply appropriate techniques, diagnose engine trouble and proffer solution
3. Demonstrate adequate knowledge of troubleshoot, repair and maintain diesel engine
4. Undertake routine checks and preventive maintenance

COURSE OUTLINE

1. Introduction to diesel engine
2. Internal combustion engine - types, component parts and principle of operation
3. The fuel injection supply system
4. Ignition system and associated electrical equipment
5. Turbocharging system
6. Cooling system
7. Lubrication system
8. Maintenance system

For Whom:

Service Technicians, Service Engineers, and Diesel Engine Mechanics

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Training Coordinator
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MECHANICAL DRIVES MAINTENANCE

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course deals with the study of the nature, operations, maintenance and lubrication of mechanical drive components such as shafts, couplings, v-belt, chains & gear drives commonly used in the Industry. The mechanical Drive components are explained in terms of their design and construction, materials and their applications. It also includes discussion on mechanical drive components' installation and maintenance procedures. The course will include hands-on practicals, which consists mainly of testing, dismantling, assembly, alignment and installation.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Understand fault diagnosis by analysing various symptoms. These symptoms include excessive heat, vibration, smell or changes in speed
2. Be aware of the possible outcomes if action is not taken once a fault has been discovered

COURSE OUTLINE

1. **Shafts:** Classification, Types, Materials, Repair and Replacement
2. **Couplings:** Common types, Application, Design and Installation
3. **V-Belt Drives:** Common types, pulleys, design and installation
4. **Chain Drives:** Common types, types of sprockets used, design and maintenance
5. **Gear Drives:** Function and applications, installation, maintenance & replacement
6. **Packing & Seals:** Types, functions and replacement
7. **Lubrication:** Types of lubricants and their characteristics, applications, additives, lubricants storage & handling, safety precautions and servicing of lubricant devices

For Whom:

Production line maintenance personnel, Installation Engineers/Technicians, Project Engineers/Technicians

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INDUSTRIAL PIPEFITTING

COURSE DURATION: 5 days

COURSE DESCRIPTION

Pipework constitutes the means of transporting fluids around the factory. The need for pipework cannot be overemphasized as pumps, steam boilers, air compressors and most industrial machines are linked in one way or another to the factory's piping network. The course therefore discusses all that is needed to know about industrial pipework.



COURSE OBJECTIVES

At the end of this course, every participant should be able to:

1. Discuss piping, valve and materials
2. Discuss pipefittings and materials
3. State and differentiate the modern types of tools for the trade
4. Select piping and valve materials based on their characteristics
5. Produce sketches of simple fabrications and pipework
6. Interpret pipe blueprint and pipe arrangement drawings
7. Thread, bend and connect pipe traps and valves e.t.c
8. Discuss Pipe welding

COURSE OUTLINE

1. Piping material and standards
2. Pipefitting and materials
3. Modern Tools of the trade
4. Blue print reading and piping arrangement drawings
5. Valves Traps, Taps and other Pipeline ancillaries
6. Pipe selection on basis of fluid to be transported
7. Pipe cutting, threading bending and pipework arrangements
8. Pipework inspection and testing
9. Pipe welding

For Whom:

Plumbers, Pipefitters, Utility operators and Technicians.

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PUMPS & COMPRESSORS

COURSE DURATION: 5 days

COURSE DESCRIPTION

This subject deals with the study and principles, operation and maintenance of pumps and compressors: basic fluid principles, principles of hydraulics, centrifugal pumps as well as their parts' auxiliary devices. It also deals with the study of compressed air fundamentals and compressor accessories. Workshop practice consists mainly of disassembling and assembling of machines mentioned above.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Explain the principles and basic concepts of hydraulics
2. Explain the Fundamentals of Pumps: Function, Duties and Types, Centrifugal, Axial and Positive Displacement Pumps, Special Duty Pumps, Selection, Installation and Pump Components
3. Acquire knowledge on Pump Operation and Performance: Pump Testing Procedures, Pump Performance (Head, Flow, Efficiency), Envelopes and impeller selections, Pump series and parallel connection, Sample calculation
4. Maintenance and Troubleshooting of different types of pumps - Preventive maintenance: Suction system and its effects, Balancing and alignment, Wear inspection and monitoring, Seal and packing
5. Acquire knowledge of the fundamentals of compressed air
6. Explain the basic principles of compressor and its application in industries
7. Acquire adequate theoretical and practical experience in the construction, operation and maintenance of compressor
8. Learn safety habits in working with compressed air and maintenance of compressors

COURSE OUTLINE

1. Introduction to Pumps and Compressors
2. Pump selection and application
3. Types of Pumps and their uses
4. Seals and Packings
5. Pump Bearings and Pump Alignments
6. Pump Installation
7. Pump Maintenance



8. Introduction (Definition of Compressors)
9. Types of Compressors
10. Compressor Layout
11. The Air Receiver
12. The Air Dryer
13. The Principles of the Cooling Tower

For Whom:

Engineers, Construction personnel, Maintenance and Operations personnel who are and will be responsible for the selection, signing, specification, installation, testing, operation and understanding of the subject matter.

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REFRIGERATION & AIR-CONDITIONING

COURSE DURATION: 5 days

COURSE DESCRIPTION

The course deals with the study of the principles and functions of refrigeration, air-conditioning, refrigerants and their properties, components of vapor compression of refrigeration, electrical components and control of refrigeration and air-conditioning units.

Workshop practice provides practical experience in servicing and maintenance of refrigeration and air-conditioning

COURSE OBJECTIVES

At the of the course, the participants should be able to:

1. State and describe the various processes occurring in the refrigeration cycle
2. State the conditions of the refrigerant in each process
3. Name and explain the function of each of the major components of a refrigeration system
Via-Compressor, Condenser, Evaporator and Refrigerant control
4. List the types of compressors via; Reciprocating, Rotary, Centrifugal and Screw and explain their operating principles
5. Select and use properly hand tools and test instruments used in refrigeration and air-conditioning work.
6. Perform trouble-shooting procedures and implement solution
7. Carryout necessary maintenance/ repair as at when do, Manage refrigerant and other refrigeration materials effectively

COURSE OUTLINE

1. Fundamentals of refrigeration and air-condition principles
2. The major components of a refrigeration system and their functions
3. Types of compressors/condensers/, evaporators and their applications
4. Basic refrigeration tools, equipment and materials
5. Fault finding /troubleshooting techniques
6. Maintenance and techniques for repairs/replacing faulty components of refrigeration and air-conditioning systems

For Whom:

Maintenance and Utilities Technicians, Maintenance Superintendents, Maintenance Supervisors

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OXY-ACETYLENE WELDING

COURSE DURATION: 5 days

COURSE DESCRIPTION

The course covers the minimum knowledge and skills the participants must learn in order to develop desirable and technical skills in welding (oxy-acetylene) mild steel plates and sheets. The activities include welding, cutting, brazing and grinding of metals.



COURSE OBJECTIVES

At the end of this course, the participants should be able to:

1. Know the basic principles of welding
2. Identify the various welding equipment and materials
3. Carry out proper welding operations
4. Carry, transport and store full and empty gas cylinders safely using appropriate equipment
5. Apply appropriate precautions and wears in gas welding operations under various conditions
6. Describe features and functions of specified gas welding equipment
7. Differentiate and compare the oxy-acetylene generators
8. Analyse calcium carbide and generate acetylene using it
9. Distinguish flames and describe their derivation processes
10. Discuss welding joints and prepare plates for them
11. Identify types of non-ferrous metals and describe the properties of materials used in fabrication engineering
12. Identify fluxes, functions and application on cast iron welding
13. Consider components composition and properties and prepare them for bronze welding operation
14. Discuss the composition and properties of worn metallic parts and the suitable materials to carry out the operation
15. Describe and state how defects can be avoided in gas welding
16. Apply appropriate tests and state causes of defects in welded joints with their remedies



COURSE OUTLINE

1. General safety precautions
2. Gas welding process
3. Non-ferrous and ferrous metal
4. Building up of worn metallic parts
5. Welded joints, defects and rectification

For Whom:

Suitable for maintenance personnel and production operators and anyone who wishes to work on or maintain industrial hydraulic systems

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ELECTRIC ARC WELDING

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course deals with the basics of Electric Arc welding. Ability of the participants to learn the basic principles of welding, identification and selection of the right welding tools, observe proper safety precaution as well as carrying out welding operations based on specification.



COURSE OBJECTIVES

At the end of this course, the participants should be able to:

1. Know the basic principles of welding
2. Identify the various welding equipment and materials
3. Carry out proper welding operations
4. Observe proper safety precautions
5. List and explain hazards in arc welding and protective wears required for welding operations
6. Apply appropriate safety precautions while welding in confined or dangerous areas
7. Differentiate and explain functions of arc welding equipment and its accessories spelling out advantages and disadvantages
8. Describe material composition and state conventional electrode classification
9. Select electrodes for welding materials and technique/positions involved
10. Carry out all position welds with sketches for various joints and explain factors governing selection of joints
11. Interpret various welding symbols and prepare different joints for various techniques and all position welds
12. Prepare and weld pipes and flanges with different methods and positions
13. Identify by inspection types, physical properties of metals and explain their welding behaviour
14. State the effect of welding on cast iron and prepare it for various types of welding
15. Identify types, composition and physical properties of non-ferrous metals
16. Carry out welding operations on various non-ferrous metals using appropriate equipment and heat
17. Identify composition of various worn metallic parts and discuss their properties with buildup operation
18. State principles, application of various cutting methods and identify arc-cutting electrodes
19. Describe major defects in arc welding joints and state how they can be tested and avoided



COURSE OUTLINE

1. Safety precautions
2. Welding machines and accessories
3. Welding joints in all positions
4. Arc welding of ferrous and non-ferrous metals
5. Building up worn metallic parts
6. Arc cutting of metal
7. Welding defects

For Whom:

Production line maintenance personnel, Installation Engineers/Technicians, Project Engineers/Technicians

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METAL INERT GAS

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course enables the Participant to understand the underlying principles that enable effective welding to take place, without focusing on specific welding processes. It treats Welding metallurgy, the physical science of welding, weld symbols, joint design, distortion, defects and testing; non-destructive (NDT) and destructive (mechanical) are included.

It also sets out the requirements for metal inert gas (MIG) welding in a modern engineering environment, in terms of what needs to be achieved by the participant, i.e. welding a series of challenging joint configurations across in a wide range of positions that are compliant to welding procedure specifications. The course is concerned with the technology and practices involved in the application of MIG welding.

The unit is broadly divided into health and safety, welding equipment, welding consumables (i.e. electrodes) and the practicalities of producing a welded joint in relation to a welding procedure specification (WPS) and a quality specification.



COURSE OBJECTIVES

Upon completion of this course, the participants should be able to:

1. Understand the fundamentals of welding
2. Know how to apply welding symbols to joint preparations
3. Understand the effects of distortion and residual stresses due to welding
4. Understand the metallurgical effects of welding
5. Know how to determine the integrity of welded joints.
6. Be able to apply safe working practices to MIG welding
7. Be able to prepare equipment for performing MIG welding
8. Be able to perform MIG welding operations to meet welding procedure specification requirements
9. Be able to evaluate welded joints for welding procedure specification conformance



PRACTICAL SESSIONS WILL INVOLVE

- Welding of stainless steel
- Welding of aluminum
- Welds in the flat position
- Welds in the horizontal – vertical position
- Welds in the vertical position

For Whom:

Production line maintenance personnel, Installation Engineers/Technicians, Project Engineers/Technicians

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ELECTRICAL COURSES

ELECTRICAL TROUBLESHOOTING USING BLUEPRINT

COURSE DURATION: 5 days

COURSE DESCRIPTION

Electrical print is a necessary tool in trouble-shooting, and ability to read print well will enhance the efficiency and skill of the maintenance personnel. This course is designed to update and prepare the maintenance personnel to read electrical prints effectively so as to be able to trouble-shoot commercial and industrial installations (industrial commercial utilities). It begins with legend and symbols, one-line and three lines and progresses through schematics drawing and trouble-shooting techniques.

COURSE OBJECTIVES

At the end of the course, each participant should be able to:

1. Identify and state each component's function in electrical working drawings
2. Analyze the current sequence within circuit drawing and components
3. Interpret installation/wiring of component in working schematic drawing
4. Logically design simple circuits using relays, diodes, contactors, timers and switches
5. Trouble-shoot and isolate faults associated with motors, generators, boiler, pumps, compressor and hoist/elevator using schematic drawings
6. Apply the logical steps in trouble-shooting exercises using relevant measuring instruments

COURSE OUTLINE

1. Print Reading Basics; legend, electrical/electronic symbols, basic layout, one-line diagram, interpretation and purpose
2. Elementary electrical diagrams purpose interpretation and uses with practical demonstration and exercises
3. Review measuring instrument for trouble shooting exercises. Meggers, AVO, phase sequence tester and test lamp
4. Electrical schematics of motor control circuits, compressors boiler, generator, pumps, hoist/lift, domestic/factory distribution network
5. Relay/ladder logic diagrams interpretation and uses
6. Logical steps techniques applicable to trouble-shooting

For Whom:

Electrical Technicians, Electro-mechanical Technician, Supervisors, Maintenance Engineers, Technical Operators.

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INDUSTRIAL MOTOR CONTROLS & MAINTENANCE

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course deals with the principles of operation, construction, circuit connection, and characteristics of AC motor controllers. Starting with fundamentals, it proceeds step by step, through all the basic kinds of controls the participant-trainee will encounter in the industry. It explains what kinds of controls are available, how they operate, where they are used and why they are designed to operate as they do. The control sequence involves operations such as starting and stopping, braking, reversing or regulating motor current, torque and acceleration, and sequential motor control.

The workshop practice consists of preparing schematic and connection diagrams, circuit wiring and installations, maintenance and repair of various industrial motor controllers available in the workshop. Laboratory experiments are provided to achieve practical understanding and application of the theoretical knowledge acquired from lectures. Laboratory exercises promote quality workmanship and safety consciousness through strict compliance to Nigerian Electrical Code provisions and safety regulations.



COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Discuss the operation of motors, control circuits for starting, reversing, limiting the speed, timing motor drives, regulating motor current, torque and acceleration
2. Install, wire-up and run motors
3. Select motor operation using name plate information
4. Determine the application of a given motor
5. Illustrate typical industrial motor circuits by schematic and connection diagrams
6. Use systematic and safe procedures in troubleshooting motor control components and circuits
7. Select and use proper type of test equipment for troubleshooting



COURSE OUTLINE

- 1 Motor Control components and symbols
- 2 Across the line controllers: On and Off motor starters, Forward/Reverse controllers, Sequential control circuits, Timer circuits
- 3 Reduce voltage controllers: Wye-delta reduce voltage starter, Primary resistance starter, Part-winding starter, Auto-transformer starter, Secondary resistance starter
- 4 Maintenance and troubleshooting of motor control components
- 5 Selection of motor control starter

For Whom:

Electricians, Maintenance Personnel, Maintenance Supervisors, Multi-skill Technician and Plant Engineers.

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Training Coordinator
training@skillupng.com
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AUTOMATION COURSES

INDUSTRIAL HYDRAULICS

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to provide the participants with an overview of fluid power technology and a working knowledge of each of the components used in fluid circuits. It is designed to enable the participant have the basic knowledge & principles in hydraulic systems or fluid power systems applicable to industry level and to equip them with the necessary skills in actual application.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Discuss the physical quantities used in hydraulic systems
2. Explain the physical properties of hydraulic fluids
3. Explain the symbols, design and principles of operation of different hydraulic elements
4. Show understanding of the construction and function of hydraulic controls and elements
5. Interpret basic hydraulic schematic diagrams in accordance with ISO standards
6. Develop the basic functional sequence representation as an aid in designing hydraulic circuit diagrams
7. Construct the basic hydraulic control circuits on simulation
8. Recognize and correct faults in hydraulic installation
9. Show awareness of the importance of safety precautions in hydraulic circuitry

COURSE OUTLINE

1. Introduction to fluid power systems
2. Basic principles of fluid power systems
3. Properties and maintenance of hydraulic fluids
4. Hydraulic power generation
5. Hydraulic actuators: Cylinders
6. Hydraulic actuators: Motors
7. Sealing devices
8. Accumulators
9. Hydraulic pressure transmission
10. Hydraulic valve principles
11. Pressure valves
12. Directional control valves



13. Non-return valves
14. Flow control valves
15. Standard (ISO 1219) symbols and circuit diagrams
16. Hydraulic systems maintenance and troubleshooting
17. Safety considerations
18. Laboratory exercises on components working principles and characteristics
19. Practical exercises on hydraulic controls design

For Whom:

Suitable for maintenance personnel and production operators and anyone who wishes to work on or maintain industrial hydraulic systems

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PNEUMATICS SYSTEMS & MAINTENANCE

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to equip the participants with the fundamental concepts in pneumatics and thus enabling the participants to design, implement and maintain pneumatics circuits.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Discuss the physical quantities used in pneumatic systems
2. Explain the physical properties and laws of air
3. Explain the symbols, design and principles of operation of different pneumatic elements
4. Show understanding of the construction and function of pneumatic controls and elements
5. Interpret basic pneumatic schematic diagrams in accordance with ISO standards
6. Develop the basic functional sequence representation as an aid in designing pneumatic circuit diagrams
7. Construct the basic pneumatic control circuits on simulation panel
8. Recognize and correct faults in pneumatic installation
9. Show awareness of the importance of safety precautions in pneumatic circuitry

COURSE OUTLINE

1. Introduction to Pneumatics
2. Overview of Pneumatic systems
3. Physical principles of Pneumatics
4. Compressors and production of compressed air
5. Preparation of compressed air for Pneumatics systems
6. Distribution of compressed air
7. Air service unit
8. Pneumatic actuators: linear drives
9. Pneumatic actuators: Rotary drives
10. Pneumatic valves



11. Pressure valves
12. Directional control valves
13. Non-return valves
14. Flow control valves
15. Combination valves
16. Pneumatic sensors
17. Pneumatic circuits and controls
18. Pneumatic system maintenance and troubleshooting
19. Safety considerations
20. Practical exercises on pneumatic control circuit design & Sequential Control

For Whom:

Suitable for anyone who is required to maintain industrial pneumatic systems, supervisors, maintenance engineers, technical operators. Prior knowledge of pneumatic or electrical principles is necessary.

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training@skillupng.com
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ELECTRO-PNEUMATIC CONTROLS

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to equip the participants with the fundamental concepts in electro-pneumatics and the participants must be able to design, implement, maintain and troubleshoot electro-pneumatics systems.

COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Define terms used in various electric and pneumatic components
2. Read and interpret various types of diagrams used to represent particular sequences of operation of machine installation
3. Design electro-pneumatic schematics and connection diagrams according to standard operating sequence
4. Construct electro-pneumatic circuits on simulation panels independently
5. Differentiate pneumatic logic elements from electrical logic elements
6. Show awareness of the importance of safety precautions in constructing electro-pneumatic controls

COURSE OUTLINE

1. Introduction to Electro-pneumatic systems (Hybrid installations)
2. Review of Pneumatic systems (pneumatic principles, pneumatic valves and actuators)
3. Fundamental principles of Electricity (Ohm's law, dc electricity, electromagnetic effect, coils & solenoids, electric power-IV, power losses- I^2R , back emf) principles
4. Electro-pneumatic components
 - 4.1 Electrical components (signal input/signal generating devices, signal processing devices, signal output devices)
 - 4.2 Sensor technology (electromechanical sensors, proximity sensors, pressure sensors, shielding)
5. Fundamentals of control theory
6. Electro-pneumatic systems and controls
7. System circuit design and hardware programming
8. Commissioning and wiring precautions
9. Electro-pneumatic system maintenance and troubleshooting (or fault finding)
10. Practical exercises on control circuit design

For Whom:

Suitable for anyone who is required to maintain pneumatic systems, supervisors, maintenance engineers, technical operators.

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PROGRAMMABLE LOGIC CONTROL (PLC)

COURSE DURATION: 5 days

COURSE DESCRIPTION

Modern PLC-based control and automation systems often have improvements and modifications made, resulting in changes needing to be made to the PLC program.

This course deals with the study of the principles of control systems engineering and serves to train the participants to describe control system tasks while at the same time giving a thorough introduction to the characteristics and features of programmable logic controls, how to make changes to existing programs and how to create small programs from scratch. Problem exercises are intensively given.



COURSE OBJECTIVES

At the end of the course, the participants should be able to:

1. Identify and explain the advantages of a programmable logic control compared to conventional controls
2. Operate programmable logic controller and personal computer
3. Identify and describe the functions of the system components of a programmable logic control
4. Make a simple program in ladder diagram and statement list programming
5. Translate a ladder diagram program into electrical statement list program
6. Translate a ladder diagram program into electrical and logic circuits equivalent
7. Solve the problem exercises
8. Observe safety practices and precautions in dealing with the system

COURSE OUTLINE

1. Introduction to programmable logic control (PLC) and their applications in the industry
2. Advantages of PLC over other controls
3. Control Systems
4. Review of Boolean Algebra and logic gates
5. Parts of a programmable logic controller
6. Review of sensors and their applications (criteria for use of mechanical, optical, capacitive, inductive, etc sensors)

7. Programming principles and procedures
8. Program loading, editing and monitoring
9. Printing and developing documentation
10. Development of sequence and logic controls
11. Controls using timers and counters
12. Programming exercises and commissioning

For Whom:

Suitable for those who have an electrical background (for example maintenance electricians) who have successfully completed Electro-pneumatics course, Automation supervisors, and maintenance engineers.

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ADVANCED PROGRAMMABLE LOGIC CONTROL (PLC)

COURSE DURATION: 5 days

COURSE DESCRIPTION

Designed to further develop participants' programming skills, the course aims to improve their ability to convert control tasks to fully operational systems.

The course continues on from the 'Introduction to PLCs' course, with the development of more complex control problems.

Additional functions such as timers and counters are used with sequential controls, and conditional programs plus manual/auto and reset control functions. A strong emphasis is placed on safety and appropriate work practices throughout the course, especially during the practical sessions.



COURSE OBJECTIVES

On completion of this course, participants will be able to:

1. Analyze control tasks
2. Understand and utilise timers, counters, flags and registers
3. Sequential controls
4. Program manual and auto modes
5. Emergency stop and reset functions
6. Modify PLC programs
7. Generating program documentation
8. Test and monitor PLC applications using PLC test systems
9. Troubleshooting using the capabilities of the PLC

For Whom:

All personnel involved with the programming of a PLC system.

Previous Knowledge

Introduction to PLCs

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Training Coordinator
training@skillupng.com
+234.809.999-2508, +234.813.406-7311

INSTRUMENTATION & PROCESS CONTROL

COURSE DURATION: 5 days

COURSE DESCRIPTION

This Course covers the key aspects of current instrumentation and process control technology and is designed to enable the learner to carry out commissioning, calibration and maintenance of the typical devices used for measurement and control in industrial systems.

COURSE OBJECTIVES

At the end of this course, participants should be able to:

1. Understand Safety while working with instruments with process control Systems
2. Appreciate the operation of typical instrumentation systems
3. Identify the various methods of signal transmission
4. Correctly connect electrical or air-powered devices
5. Understand the equipment used in Current loops (process meters, trip amplifiers, transmitters, current repeaters, chart recorders)
6. Temperature measurement (RTDs, thermocouples, etc.)
7. Pressure measurement (bourdon gauges, air and electrical DP cells)
8. Level measurement (bubblers, pressure cells, ultrasonic, load cells)
9. Flow measurement (orifice plates, mag-flow meters, mass-flow meters, weirs, flumes, etc.)
10. Output devices (flow control valves, valve positioners, I to P converters)
11. Correctly use a range of industrial calibration equipment (current sources, thermocouple and RTD
12. Simulators, digital pressure indicator/calibrators, HART communicators)
13. Correctly connect, commission and calibrate current loop devices, temperature transmitters, pressure
14. Switches, pressure sensors, DP cells, ultrasonic level meters, load cell amplifiers, I to P converters and Hart devices
15. Understand the principles of turbidity, density, PH, proximity and weight measurement
16. Troubleshooting instrument error



COURSE OUTLINE

1. Introduction
2. Open-loop and Closed-loop controls
3. System static and dynamic behaviour
4. P&I diagrams
5. Level (L) measurement and control
6. Flow (F) measurement and control
7. Pressure (P) measurement and control
8. Temperature (T) measurement and control
9. Controllers
10. Setting controller parameters
11. Process control optimization and monitoring

For Whom:

Ideal for those who presently possess some electrical knowledge, work in a maintenance environment and seek to expand their activities to include process control and instrumentation systems and maintenance engineers.

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PROCESS VISUALISATION & CONTROL

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course exposes its participants to technologies involved in process automation, using programmable logic controllers (S7 300 PLC) and computer based visualization software (Wincc Flex).

COURSE OBJECTIVES

At the end of the course, participants should be able to:

1. Describe the role of PLC's and HMI in process automation
2. Describe the function of tags
3. Write program for 2-step control
4. Write program for continuous control for level, flow, pressure, temperature, etc.
5. Setup a simple process visualization converting a personal computer to HMI

COURSE OUTLINE

1. Normalising / Scaling
2. Programming On – Off and PID Controls
3. HMI
4. Screens
5. Tags
6. Trends
7. Alarms / Messages
8. Documentation

For Whom:

Automation personnel

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SENSOR TECHNOLOGY

COURSE DURATION: 5 days

COURSE DESCRIPTION

There has been an unprecedented growth in the number of products and services, which utilise information gained by monitoring and measuring using different types of sensors.

This course deals with sensors, types, design and its



COURSE OBJECTIVES

Upon completion of the course, you should be able to:

1. Describe sensors, types and their applications
2. Describe design and operating principles of sensors
3. Identify components of International and North American mechanical limit switches
4. Describe design and operating principles of sensors
5. Apply correction factors where appropriate to sensors

COURSE OUTLINE

1. Introduction to sensor technology
2. Sensors classification, characteristics and types
3. Sensor Applications
4. Identify the various scan techniques of sensors
5. Identify ten categories of inductive sensors and sensors in each category
6. Describe the effects of environment on sensors

For Whom:

Suitable for anyone who is required to maintain industrial pneumatic systems, supervisors, maintenance engineers, technical operators. Prior knowledge of pneumatic or electrical principles is necessary.

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CONSTRUCTION COURSES

HEALTH, SAFETY & ENVIRONMENT MANAGEMENT

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course would give participants a thorough understanding of safety and environmental management process through determining and applying appropriate standards and methods to identify and minimize the likelihood of accidents, injuries and environmental impact during projects and plant operations. Ultimately, the course would equip participants in analysing and quantifying the hazards and risks to health, assets and environment in any organization's business processes and help recommend appropriate control measures to reduce risks and guarantee safety of personnel, assets and the environment.



COURSE OBJECTIVES

At the end of this course, participants would have gained a deeper and practical knowledge of:

1. General Health, Safety and Environment
2. Basic First Aid
3. Occupational Health and Safety Management
4. Fire fighting Techniques
5. Occupational Health and Hygiene

COURSE OUTLINE

1. Fundamental principles of Environmental, Safety and Health Management
2. Identifying hazards
3. Investigating accidents and incidents
4. Environmental protection
5. Personal safety
6. First aid administration
7. Planning for hazard identification, risk assessment and risk control
8. Occupational health safety system management program
9. Emergency preparedness and response
10. Performance measuring, monitoring and improvement with regards to safety
11. Strategies, procedures, checklists, data collection, data analysis, reporting
12. Personal protective equipment.



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BASIC BRICKLAYING/ BLOCKLAYING & CONCRETE

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to develop the basic knowledge and skills of the participant in bricklaying, blocklaying, pre-cut stone, concrete and other types of building blocks in mortar to construct and repair walls, foundations, partitions and other

COURSE OBJECTIVES

The aim of this course is to introduce the participants to the following:

1. Maintain safe working conditions and to adopt safe procedures for themselves and others
2. Basic tools of Bricklaying: Laying tools, Wall straightening tools, Cutting and Trimming tools and finishing tools
3. Care of tools
4. Mortar:
 - i. Types of Mortar: Lime mortar, Cement mortar, Gauge mortar (Cement/lime mortar)
 - ii. Characteristics of mortar
 - iii. Principles of a good mortar
 - iv. Plasticizers: Mortar ratios, Proportioning (Water/Cement), Aggregate/Cement
 - v. Mortar bed/Mortar joint preparation.
5. Bonding:
 - i. Brick Characteristics: Features, Colour, Manufacturing & Stacking procedure & size
 - ii. Types of Bonding: Flemish, English, Running, Broken, Quetta, Rat-traps etc
 - iii. Drawing practice of various Bonding
 - iv. Setting out Bond: Quoin Bricks, Stretch, Head, Bricks types and special purpose Bricks or purpose made brick
 - v. Junction Walls, Cross Walls, Stopped Walls, Raking backs, Toothed ends
 - vi. Brickwork Practice
6. Concrete Practice:
 - i. Introduction and definitions
 - ii. Tensional and Compressional stress
 - iii. Aggregates: Types, Characteristics, Source, Grading and Testing
 - iv. Cement: Types, Characteristics, Manufacturing and Testing
 - v. Grading workability, Plasticizers ,Batching (Mix circle), Placing compaction curing
 - vi. Test of concrete when fresh, Slump test, Compacting factor test, vebe consistometer test
7. Reinforcements

For Whom:

Bricklayer, Construction supervisor

For enquiries and Nomination contact:

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ELECTRICAL MAINTENANCE SKILLS (BUILDING SERVICES)

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to provide the skills necessary to carry out first-line maintenance on electrical installations in hospitals, schools, hotels, offices, etc. It will enable site services, maintenance or estates personnel to deal safely with a wide range of tasks on electrical distribution (low voltage panels) and final sub-circuits for single and three phase equipment such as lighting, heating, air conditioners, pumps, elevators, stabilized and uninterruptible power supplies for electronic systems. The course starts with a review of basic electrical principles.

This grounding in the fundamental concepts ensures a full understanding of the technical and safety issues in the later stages of the course. Candidates learn in a practical way the applications of Ohm's law, series and parallel circuits etc, seeing at firsthand what the relationships are between voltage, current and resistance.



COURSE OBJECTIVES

On completion of the course, participants will be able to

1. Practice safe working methods on electrical systems
2. Understand the relevant regulative requirements
3. Demonstrate an understanding of electrical principles and units
4. Identify a wide range of electrical equipment & devices and understand their principles of operation and applications
5. Understand earthing and protection systems and associated protective devices
6. Demonstrate an understanding of electrical distribution systems; isolation, protection, load monitoring and balancing techniques
7. Diagnose basic faults and recognise their associated symptoms
8. Work with a range of cable types and carry out correct terminations and connections
9. Safely remove and replace the range of electrical components commonly found in lighting, power, radial and ring circuits (switches, sockets, lamps, heaters etc)
10. Perform visual inspections of minor works
11. Perform pre-commissioning tests on electrical works using continuity and insulation testers, earth fault loop testers etc
12. Complete a minor works certificate



COURSE OUTLINE

1. Fundamental Units of measure, and engineering prefixes
2. Electrical distribution systems
3. Electrical safety
4. Ohm's law and applications
5. Series and parallel circuits
6. Electro-magnetism and applications (solenoids, relays motors etc)
7. Electrical protection systems
8. Final sub-circuits and cable sizing
9. Electrical measuring instruments, sensors and detectors
10. Electrical testing and fault-finding procedure(troubleshooting)

Note: Emphasis is very much on learning by doing and the development of useful, practical skills with particular stress being placed upon safety. Comprehensive course notes.

For Whom:

Maintenance Supervisors, Electrician and Utilities Technicians. Non-electrical personnel in maintenance and estates departments can also benefit from this course.

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REFRIGERATION & AIR-CONDITIONING

COURSE DURATION: 5 days

COURSE DESCRIPTION

The course deals with the study of the principles and functions of refrigeration, air-conditioning, refrigerants and their properties, components of vapor compression of refrigeration, electrical components and control of refrigeration and air-conditioning units.

Workshop practice provides practical experience in servicing and maintenance of refrigeration and air-conditioning equipment.



COURSE OBJECTIVES

At the of the course, the participants should be able to:

1. State and describe the various processes occurring in the refrigeration cycle
2. State the conditions of the refrigerant in each process
3. Name and explain the function of each of the major components of a refrigeration system
Via-Compressor, Condenser, Evaporator and Refrigerant control
4. List the types of compressors via; Reciprocating, Rotary, Centrifugal and Screw and explain their operating principles
5. Select and use properly hand tools and test instruments used in refrigeration and air-conditioning work
6. Perform trouble-shooting procedures and implement solution
7. Carryout necessary maintenance/ repair as at when do, Manage refrigerant and other refrigeration materials effectively

COURSE OUTLINE

1. Fundamentals of refrigeration and air-condition principles
2. The major components of a refrigeration system and their functions
3. Types of compressors/condensers/, evaporators and their applications
4. Basic refrigeration tools, equipment and materials
5. Fault finding /troubleshooting techniques
6. Maintenance and techniques for repairs/replacing faulty components of refrigeration and air-conditioning systems

For Whom:

Maintenance and Utilities Technicians, Maintenance Superintendents, Maintenance Supervisors

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Training Coordinator
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PLUMBING

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to develop the knowledge and skills of the participant on lay out, test and maintenance of pipes, fixtures, fittings, gas meters and regulators. The course will discuss installation of equipment such as boilers, pumps, heating and cooling systems, natural gas appliances, and water tanks.

COURSE OBJECTIVES

At the end of the course, every participant should able to:

1. Understand and adhere to the general safety of workshop and worksite
2. Select correct tools for cutting, forming, moulding and bending of sheet metals
3. Adopt correct methods of plumbing materials with fasteners and adhesives
4. Identify and know the usage of materials in plumbing
5. Identify and know the usage of fittings and fixtures used in Hot & Cold water systems
6. Understand layout of wastewater and drainage pipe system

COURSE OUTLINE

1. Introduction to Plumbing
2. Safety at work
3. Identification and a selection of basic hand tools and explain their use.
Tools: hacksaw, hammers, tape measure, spirit level, reamer, jointing equipment (spanners, portable heating equipment), benders (hand bender, spring)
4. State the method of cleaning and storing basic hand tools.
Method: wipe clean/dry, secure storage
5. Identify portable power tools suitable for drilling walls for screw fixings and pipe access.
Equipment: electric drill, hammer drill, rechargeable battery operated drill, transformer
6. Identify the different types of twist drills suitable for various applications.
Applications: walls, thin metal plate Twist drills: masonry, high speed steel
7. State the method for storing portable power tools
Method: clean, dry, lubricated, cable care, secure



8. Identify the basic types of pipe and clips used for domestic water services
Pipes: *steel, copper, plastic*
9. Identify the basic types of jointing system used for domestic water services
Jointing system: *solder, compression, push fit, threaded*
10. Identify the basic types of pipework accessories used for domestic water services
Accessories: *taps, fittings (bend, elbow, tee, connectors, valves)*
11. State the method for storing portable heating equipment
Method: *store (dedicated/ventilated), no naked flame, external light switch, vapour proof light fittings*
12. Find and mark position for connections, then cut holes through walls and floors to accommodate pipes, measure pipes and mark cutting or bending lines
13. Cut, thread and bend pipes, assemble and install piping, valves and fittings, join pipe sections and secure pipes
14. Test lines as required by local plumbing regulations
15. Install equipment such as boilers, pumps, heating and cooling systems, gas appliances, water tanks, water heaters, solar water heating systems, fixtures such as toilets, wash basins and industrial processing units
16. Maintain and repair plumbing systems

For Whom:

Plumbers, gas fitters, roof plumbers, drainers, fire protection workers and irrigation installers.

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MAINTENANCE OF PLUMBING SYSTEMS

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is specifically designed to provide non-mechanical specialists with the skills needed to carry out first-line mechanical maintenance on low pressure hot water (LPHW) heating systems, hot and cold water services, and drainage systems – together with associated pipe-work, pumps, valves and other ancillary equipment.

COURSE OBJECTIVES

On completion of the course, participants will be able to:

1. Apply safe working practices and meet relevant regulative requirements when working with mechanical building services
2. Understand different types of LPHW system
3. Diagnose faults on LPHW systems
4. Carry out bending of copper tube
5. Correctly assemble and tighten compression joints
6. Correctly fabricate soldered pipe-work joints
7. Remove and replace radiators, radiator valves and taps
8. Dismantle thermostatic mixer units and replace defective parts
9. Correctly recharge pressure vessels

COURSE OUTLINE

1. Introduction to plumbing
2. Plumbing tools
3. Pipework joints
4. Interpretation of drawing
5. Describing two-pipe systems
6. Describing open-vented systems
7. Describing hot water systems

For Whom:

Estates departments responsible for the upkeep of the services of buildings used as office blocks, hospitals and universities etc, maintenance personnel.

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PAINTING & DECORATION

COURSE DURATION: 5 days

COURSE DESCRIPTION

This course is designed to develop basic knowledge and skills of the participants on how to apply paint, wall coverings and other finishes to interior and exterior surfaces of buildings and other structures.



COURSE OBJECTIVES

Upon completion of this course, the participants should be able to:

1. Perform surface preparation on new and existing surfaces.
2. Apply coatings by brush, roller and spray to surfaces of wood, metal, brick, concrete, and plaster for decorative and protective purposes. This occurs in residential, commercial, institutional and industrial settings.
3. Apply wall coverings to surfaces in residential and commercial buildings.
4. Be proficient in the safe use of hand tools and power equipment
5. Perform assigned tasks in accordance with safety, quality, environmental and production standards required by industry.
6. Calculate areas and relate these calculations to required material.

COURSE OUTLINE

1. Introduction to Painting and Decorating
2. Safety considerations
3. Surface preparation theory & Procedures
 - Explain the functions of the tools used in the surface preparation process.
 - Select from the correct natural and/or synthetic abrasives for each surface preparation process.
 - Describe the removal of coatings and/or wall coverings from various substrates.
 - Describe the types and uses for patching and stopping compounds.
 - Describe the surface preparation process and the finishing sequence for new and previously coated drywall surfaces.
 - Describe the surface preparation process and the finishing sequence for new and previously coated



plaster surfaces.

- Describe the surface preparation process and the finishing sequence for new and previously coated masonry surfaces.
 - Describe the surface preparation process and the finishing sequence for new and previously coated wood surfaces.
4. Drywall finishing theory & Procedures
 - Describe tools required for drywall finishing.
 - Describe materials and procedures used for drywall finishing.
 5. Components of conventional coatings and their performance characteristics.
 6. Fundamental understanding of colour theories as they relate to painting and decorating.
 - Mix colours to match wet and dry colour samples.
 - Construct colour charts.
 7. Describe the procedures for completing basic decorative finishes.
 - Describe preparation required for decorative finishing.

For Whom:

Estates departments responsible for the upkeep of the services of buildings used as office blocks, hospitals and universities etc, maintenance personnel.

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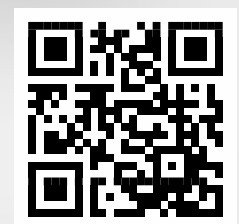


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Guilds**
Approved Centre

SKILLUP TVET LIMITED

Government Technical College, Ikorodu
City & Guilds Centre No 834027
28, Obafemi Awolowo Way
Oke Ota-Ona, Ikorodu

T: +234-809-999-2508
E: info@skillupng.com



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